



EROS Past, Present, and Future

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Center for Earth Resources Observation and Science

“Project EROS”

“...the time is now right and urgent to apply space technology towards the solution of many pressing natural resource problems being compounded by population and industrial growth.”

Secretary of the Interior
Stewart L. Udall –1966

Center for Earth Resources Observation and Science



Data Acquisition/Access:

To ensure that scientists, businesses, decision makers and the public have ready access to land information

Data Archives:

To safeguard and expand the national archive of remotely sensed land data

Science:

To promote applications, knowledge and use of land information to better understand our planet



Center for Earth Resources Observation and Science



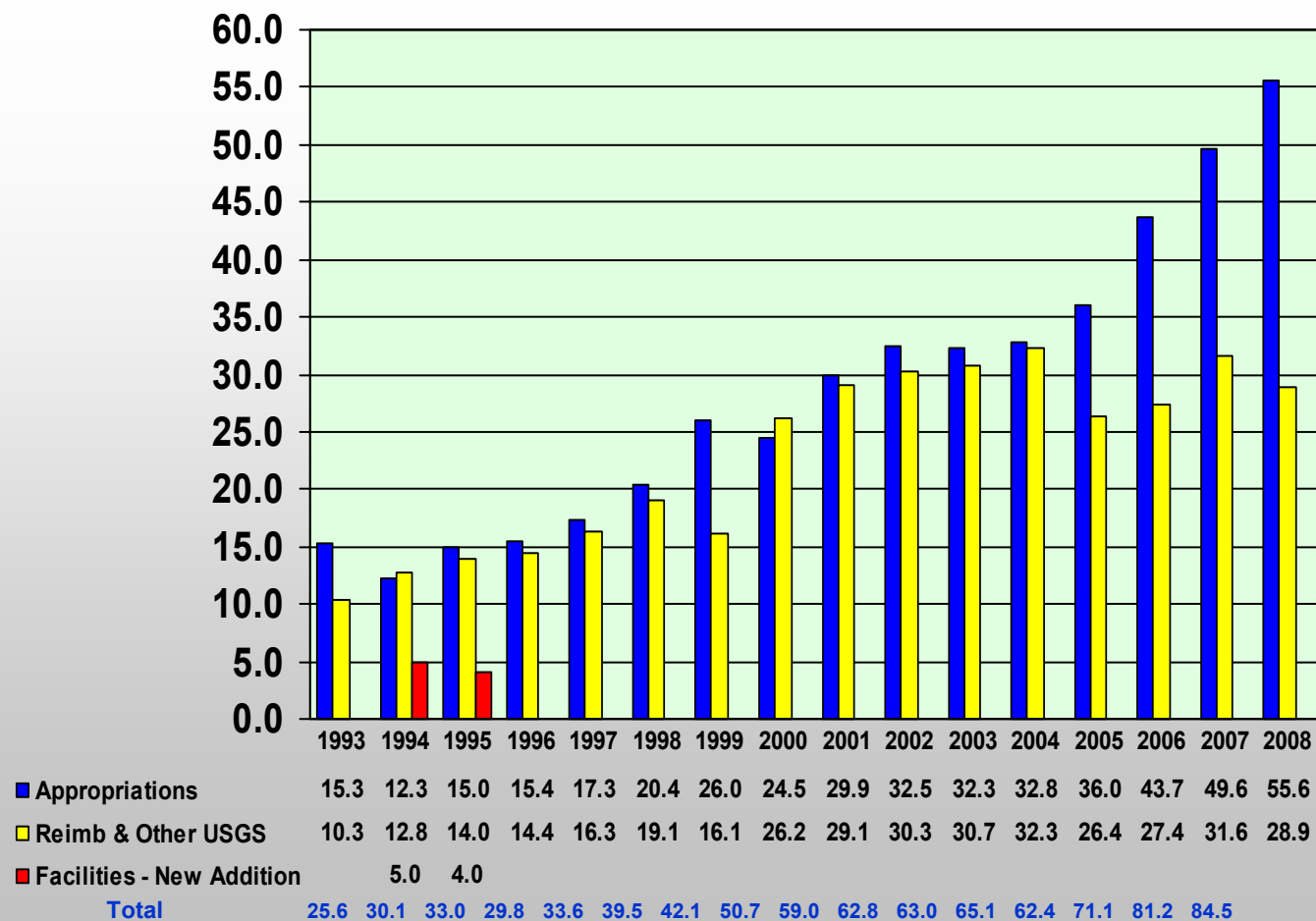
Instrument Suite: AERONET: Aerosol Robotic network
 SCAN: Soil Climate Analysis Network - USDA
 ANSS: Advanced National Seismic Station - USGS
 CORS/GSOS: Constantly Operating Reference Station / GPS Surface Observing System
 RCS: Reference Climate Station - Canada - Future Site
 CRN: US Climate Reference Network
 SURFRAD: Surface Radiation Network

Contracts

- **Technical Services Support Contract**
 - **Stinger Ghaffarian Technologies (SGT)**
 - Subcontractors - ADNET Systems, Inc., Information Dynamics, NCDC Imaging, Riverside Technology, Inc.
 - **Awarded 4/1/08, Base Year Plus 4 Option Years**
 - **Contract Value: \$140.8M**
 - **Cost Plus Award Fee, Performance Based Acquisition**
- **Scientific Support Services Contract**
 - **Arctic Slope Regional Corporation Research and Technology Solutions (ARTS)**
 - **Awarded 4/1/08, Base Year Plus 4 Option Years**
 - **Contract Value: \$10.9M**
 - **Cost Plus Fixed Fee, Performance Based Acquisition**
- **Landsat Data Continuity Contract**
 - **Science Application International Cooperation**
 - **Awarded 4/1/08, Base Year Plus 3 Option Years**
 - **Contract Value: \$21M**



Budget



Archiving at EROS

Film Archives

- 1939 to Present
 - 24 Major Collections
 - Multiple film formats/sizes
 - Over 8.6 million frames

Digital Archives

- 1972 to Present
 - 1 to 2 Terabytes / Day
 - 2.4 Petabytes
 - Over 37 million scenes

Responsibilities

- **Populate** the Archive
- **Preserve** the Archive - **HOLD in TRUST**
- Provide **Access** to the Archive
- **Distribute** Products from the Archive
- **Manage and Improve** the Archive
- **Seek Advice** Regarding Archive Population/ Management



Status of Landsats 5 and 7

■ Landsat 5

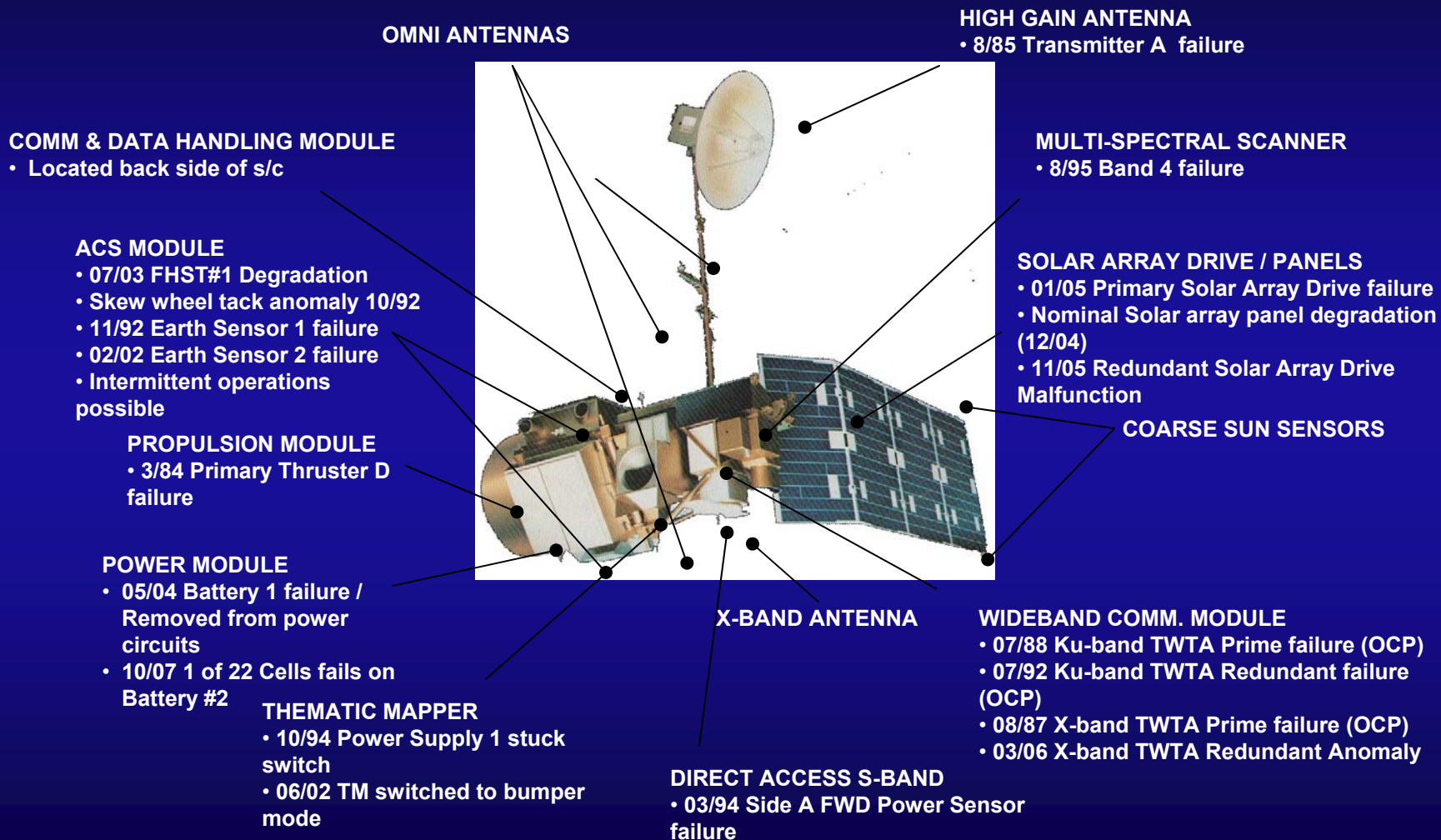
- Launched in 1984; 24 years old (3-year design life)
- Extended life allows for 8-day Landsat coverage
- Providing ground station reception-area coverage for U.S. and its International Cooperators
- Operating on several backup subsystem components
- Items of concern: Transmitters, Solar Arrays, Batteries...
- End-of-Life: Projected to be 2012

■ Landsat 7

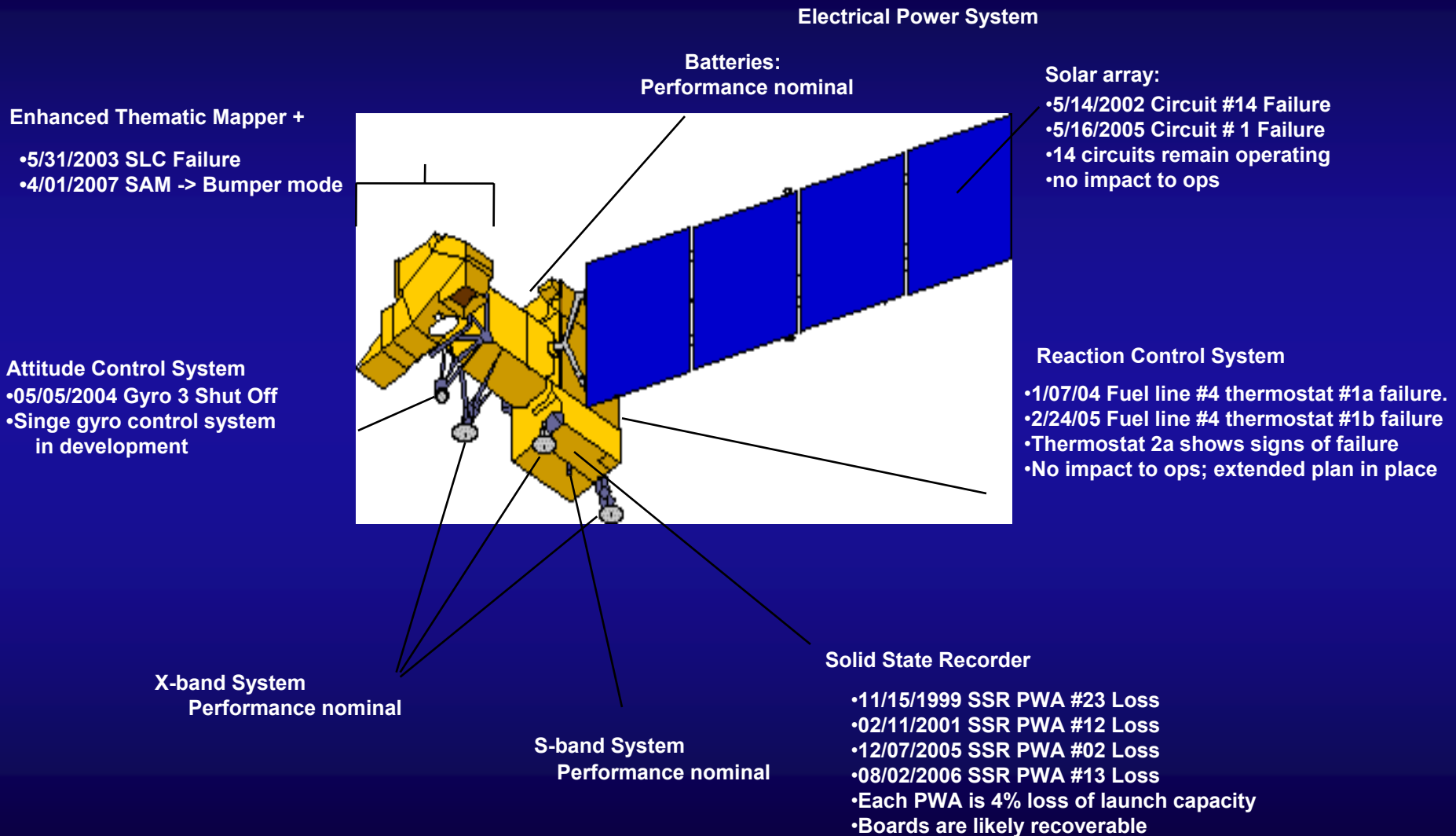
- Launched in 1999; suffered key sensor degradation in 2003
- Providing routine global land cover record for U.S. archive
- Each scene retains 75% of high-quality data
- For some users, scenes are useful “as is” with 25% missing along edges
- Scenes filled in by ground system processing are also useful
- Items of concern: Gyroscopes
- End-of-Life: Projected to be 2012



Landsat 5 Spacecraft Status



Landsat 7 Spacecraft Status



Landsat Data at No-Charge

- **Began as Pilot to LDCM Distribution Policy**
- **Distribution of Landsat 7 ETM+ SLC-off over the U.S began June 4, 2007**
- **First month distributed more than 2,500 scenes – equivalent to 3 months of normal distribution**
- **Over 13,158 scenes distributed in 348 days between June 4, 2007 and May 16, 2008**



Secretary Kempthorne Showcases Free Public Availability of Landsat Satellite Image Archive at ESRI Conference

SAN DIEGO, CA -- Secretary of the Interior Dirk Kempthorne announced at the ongoing ESRI Conference that his direction to the U.S. Geological Survey (USGS) to make its 35-year Landsat satellite image archive available over the Internet for free marks the commitment of the department to breaking down information barriers.

“With the click of a mouse, scientists, government officials and land managers will be able to see the changes in the earth’s landscape at any point in the past three and a half decades,” he told the conference on Saturday.



“As Secretary of the Interior, I have made breaking down barriers and building bridges a high priority of the department,” Kempthorne said to attendees of the ESRI International User Conference in San Diego.

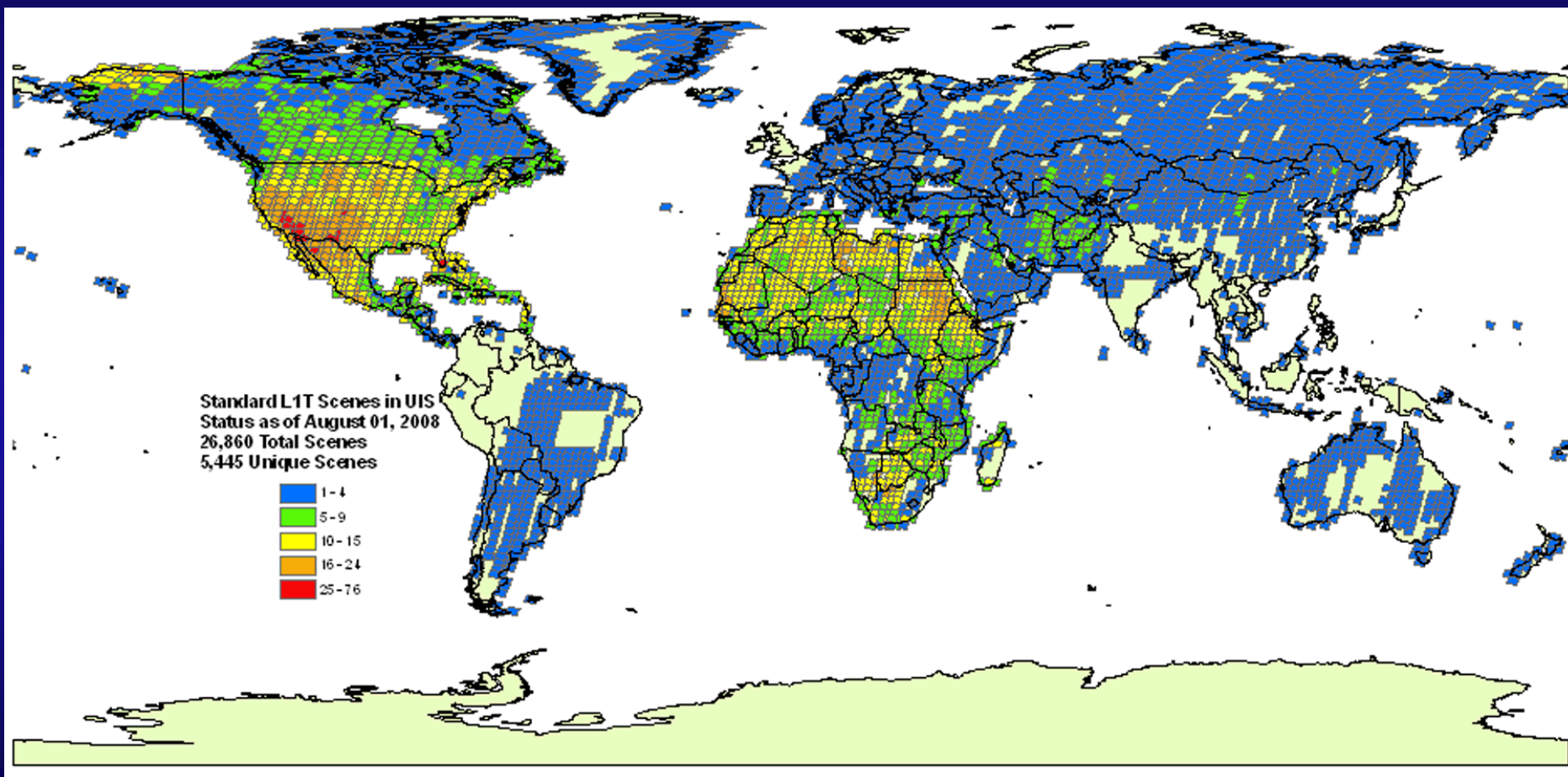
[Photo Credit: Tami Heileman] [Hi-Res](#)

Landsat Standard Product

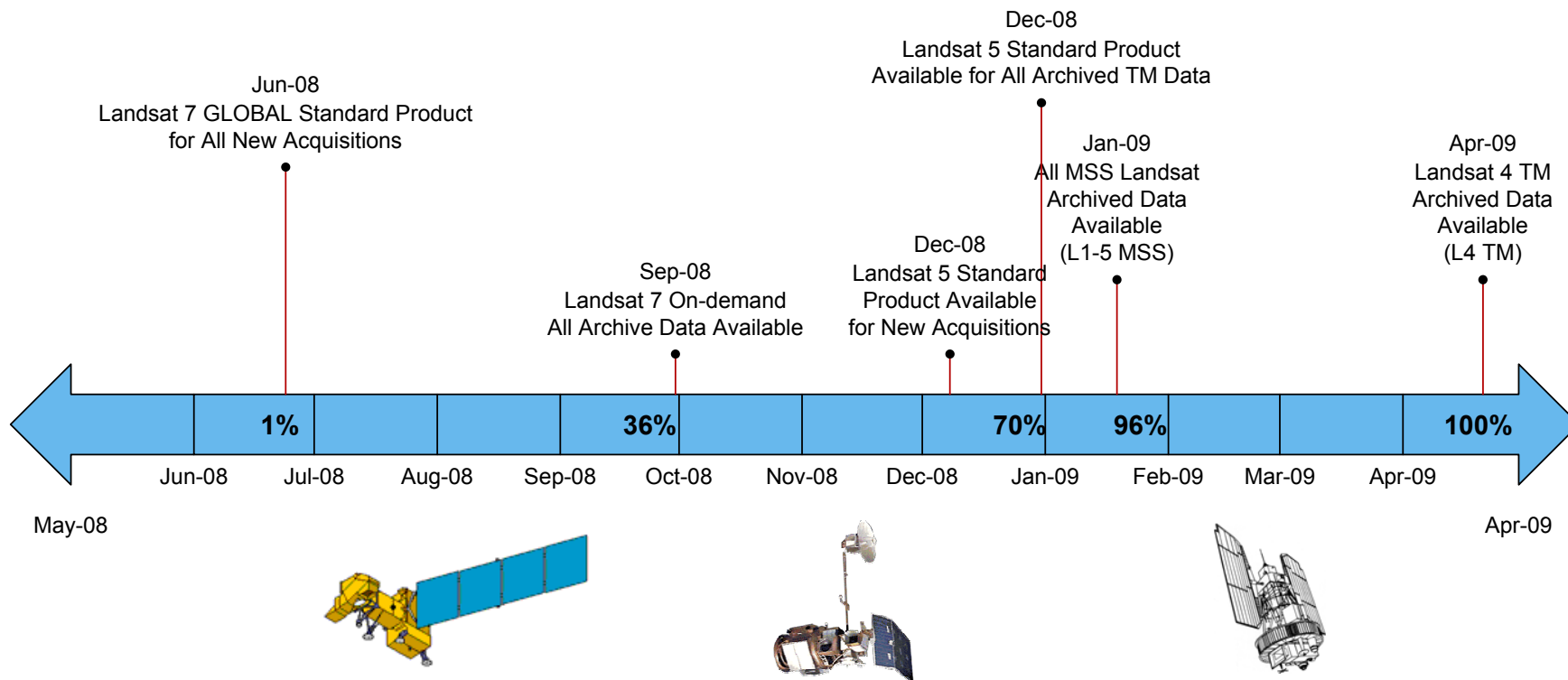
- Dataset currently processing
 - L7 ETM+ SLC-off only; newly acquired
 - $\leq 20\%$ cloud cover, high quality
- Pixel size: 15m/30m/60m
- Media type: Download (web-enabled), CD/DVD (\$50)
- Product type: L1T (terrain-corrected)
- Output format: GeoTIFF
- Map projection: UTM (Polar Stereographic for Antarctica)
- Orientation: North up
- Resampling: Cubic convolution
- DEM: GLS DEM (SRTM, NED, CDED, DTED, GTOPO 30)



Landsat L-1T SLC-Off Data Available



Timeline for all Landsat at No-Charge



Landsat 8 (Landsat Data Continuity Mission)

■ NASA:

- Procures satellite, imaging instrument, and launch services
- Manages mission integration and post-launch system checkout
- Transfers satellite to USGS after on-orbit checkout
- Cooperates with USGS in ongoing data calibration/validation
- Awarded contracts to Ball Aerospace for imaging instrument and Lockheed Martin for launch vehicle; satellite contract pending

■ USGS:

- Procures ground station network, ground data archive and processing systems, and flight operations facility
- Coordinates with NASA on mission integration and system checkout
- Operates satellite and manages data archive and distribution
- Sponsors Landsat Science Team co-chaired by USGS and NASA
- Manages ongoing data calibration/validation
- Awarded contract to SAIC for ground system development; ground station network and flight operations contracts pending

■ Landsat 8 launch in 2011



Landsat 8 (Landsat Data Continuity Mission)

Mission Science Objective: Extend the multi-decadal Landsat land surface observations to study, predict, and understand the consequences of land surface dynamics

Key Science Products: Moderate resolution maps of land cover/land use change over multiple decades including deforestation, agricultural extensification, and urbanization; documentation of ecosystem fragmentation and connectivity; identification and quantification of regional to continental scale sources and sinks of carbon

Mission Description and Status:

S/C: Awarded to General Dynamics Advanced Information Systems

Instrument: Operational Land Imager (OLI) multi-spectral, 30m,
185km swath (Ball Aerospace)

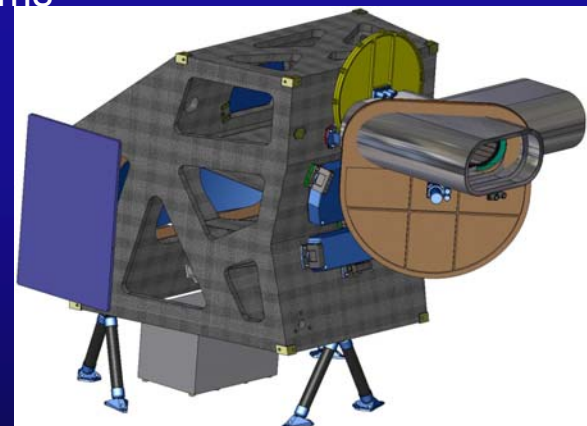
Launch Vehicle: Atlas V Model 401 (Lockheed Martin)

Orbit: 705 Km circular, sun-synch, 98.2°, 10:00 am +/- 15 mins.,
16-day repeat

Mission Life: 5 Years (with consumables for 10 years)

Mission Project Management: NASA/USGS

Launch Date: No Earlier Than (NET) July 2011

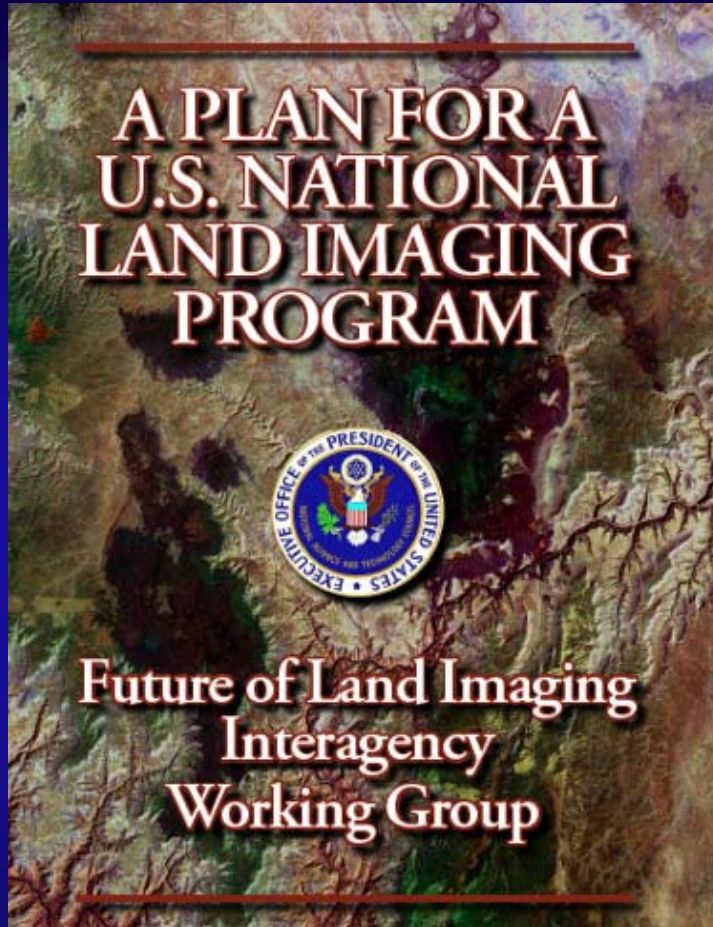


Department of the Interior (DOI) – 1966 to Present

- 1966 - DOI Initiates Earth Resources Observation Systems Program:
“...the time is now right and urgent to apply space technology towards the solution of many pressing natural resource problems being compounded by population and industrial growth.”
Secretary of the Interior Stewart L. Udall
- 1992 - Land Remote Sensing Policy Act passed
- 2007 - White House initiates National Land Imaging Program under DOI leadership:
The time is now right and urgent to apply **operational** space technology towards the solution...
- 2008 - Initial funding requested in President's FY 2009 Budget for the National Land Imaging Program



National Land Imaging Program



- In December 2005, the President's Science Advisor stated:
 - "It remains the goal of the U.S. Government to transition the Landsat program from a series of independently planned missions to a sustained operational program..."
- Future of Land Imaging Interagency Working Group (FLI IWG) guidance.
 - Why does the U.S. need moderate-resolution land imagery?
 - What are the key societal benefits of moderate resolution land imaging?
 - What are the options for acquiring these capabilities or data?
 - How should U.S. land imaging be managed and governed?



NLIP Report Recommendations

- The U.S. must commit to continue the collection of moderate-resolution land imagery.
- The United States should establish and maintain a core operational capability to collect moderate-resolution land imagery through the procurement and launch of a series of U.S.-owned satellites (Landsat 9 and beyond).
- The United States should establish the National Land Imaging Program, hosted and managed by the Department of the Interior, to meet U.S. civil land imaging needs.



NLIP Responsibilities

- **NLIP Mission:**
 - To serve the Nation by acquiring and providing operational land imaging capabilities and applications to support U.S. economic, environmental, foreign policy, and security interests.
- **DOI and USGS will:**
 - Coordinate a Federal Land Imaging Council and a (FACA) Land Imaging Advisory Committee;
 - Gather U.S. Land Imaging requirements (optical, SAR, etc.);
 - Acquire U.S. Land Imaging systems and data;
 - Develop new applications for Federal, State, and local government;
 - Investigate and develop new remote sensing technology;
 - Ensure data delivery to universities and scientists, NGOs, and international organizations; and
 - Coordinate acquisition and data distribution plans with U.S. industry, foreign governments, and foreign commercial firms.
- Above all else, “Ensure availability, access, and ease of use of land imaging data for the Nation.”



NLIP: First Steps

Beginning in FY 2009:

- Coordinate and promote the uses of land imaging data including identifying requirements for operational and imaging capability;
- Conduct a comprehensive evaluation of societal and economic benefits of moderate-resolution land imaging data;
- Establish a Federal Land Imaging Council to advise the Department on how operational land imaging data relates to the purposes of the Federal Government;
- Establish a Land Imaging Advisory Committee, composed of representatives of State, local and tribal government, science and non-profit institutions, and U.S. commercial industry to advise on their needs for operational land imaging capabilities, data, and applications; and
- Establish cooperative agreements and grants with scientists and universities to jointly develop innovative applications (e.g, land use change, climate effects, water monitoring, and agriculture and natural resource management support) that address societal needs.



Questions?

